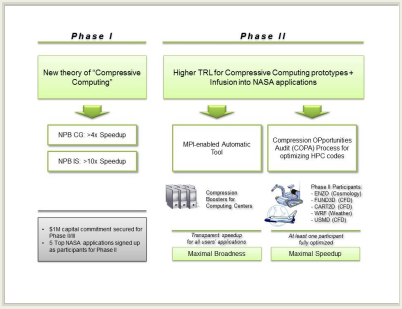
Small Business Innovation Research/Small Business Tech Transfer

Accelerating Communication-Intensive Applications via Novel Data Compression Techniques, Phase II

Completed Technology Project (2014 - 2017)

Project Introduction

The traditional view of arithmetic operations dominating the computational cost of numerical algorithms has changed. As performance of new processors increases, we are moving into a new reality in which data movement is expensive and operations are becoming nearly free. In Phase I we discovered a new theory of data compression with unprecedented capability to reduce data movement in distributed HPC applications. Phase I results include: 1) the demonstration via proof-of-concept prototypes of lossless compressive gains of 4x-20x for NAS Parallel Benchmarks, and 2) the formulation of COPA, a Compression OPportunities Auditing & discovery process that facilitates the analysis of any given large-scale code with the purpose of optimizing it for performance via data movement reduction. Phase II targets the consolidation of the new theory through two major thrusts: 1) the development of software that facilitates integrating high-yield compression into HPC codes, and 2) the further infusion of the technology into NASA applications. Thrust 1 will produce a fully functional prototype of a software suite for the automatic/semi-automatic acceleration of HPC codes via compression. The prototype will incorporate ease-of-infusion features (e.g., MPI-enabled compression and decompression routines), as well as ergonomic features that allow the seamless integration of new compression modules into the suite. Thrust 2 will begin with the application of the Chapter 1 of COPA to five HPC codes of utmost importance to NASA, namely Cart3D, FUN3D, USM3D, Enzo, and WRF. Accelogic will collaborate with the developers of these codes to integrate the compression technology under three different levels of "integrability," namely automatic, semi-automatic, and manual. By the end of Phase II, at least one of these applications will undergo the complete COPA optimization process. Complementary Phase II/III funds for $1+ million have been secured to ensure successful commercialization.



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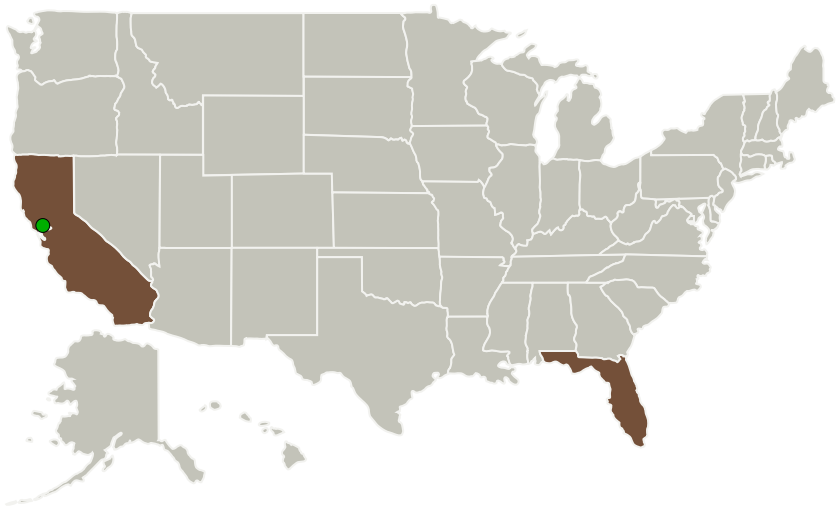
Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
Accelogic, LLC	Lead Organization	Industry	Weston, Florida
Ames Research Center(ARC)	Supporting Organization	NASA Center	Moffett Field, California

Primary U.S. Work Locations	
California	Florida

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Accelogic, LLC

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

Juan Gonzalez

Co-Investigator:

Juan Gonzalez

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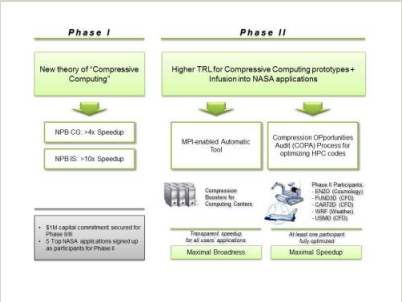
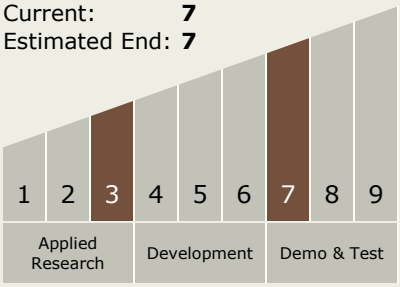
Images



Briefing Chart Image
Accelerating Communication-Intensive Applications via Novel Data Compression Techniques, Phase II
(https://techport.nasa.gov/image/128048)

Technology Maturity (TRL)

Start: **3**
Current: **7**
Estimated End: **7**



Technology Areas

Primary:

- TX11 Software, Modeling, Simulation, and Information Processing
  - TX11.1 Software Development, Engineering, and Integrity
    - TX11.1.7 Frameworks, Languages, Tools, and Standards

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System